

### **REMARKS**

Applicants appreciate the Examiner's thorough consideration provided in the present application. Claims 1-11 are currently pending in the instant application. Claims 1 and 7 have been amended. Claim 1 is independent. Claims 10 and 11 have been added for the Examiner's consideration. Reconsideration of the present application is earnestly solicited.

Applicants submit that the subject matter of claims 10 and 11 is fully supported by the original written description, including, but not limited to, page 9 of the specification.

### **Drawings**

Applicants have voluntarily amended the drawings to address potential informalities with FIG. 9. Specifically, FIG. 9 has been amended to include the reference numerals 18 that are further described in connection to FIG. 9 on page 10, lines 13-24 of the specification. A replacement, formal drawing incorporating the above-identified change is provided as an attachment to this Amendment. Applicants respectfully request acknowledgment of the Examiner's receipt and subsequent approval of all of the formal drawings in the present application as soon as possible.

**Claim Rejections Under 35 U.S.C. § 103**

Claims 1 and 4-8 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Maruyama (U.S. Patent No. 6,635,911) in view of Nishi (U.S. Patent No. 5,286,988), and further in view of Yano et al. (U.S. Patent No. 2,853,853). Claims 2 and 3 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Maruyama in view of Nishi, and further in view of Yano et al. and Narui et al. (U.S. Patent Publication No. US 2001/0054723). These rejections are respectfully traversed.

In light of the foregoing amendments to the claims, Applicants respectfully submit that all of the rejections have been obviated and/or rendered moot. Accordingly, these rejections should be withdrawn and the present application should be passed to Issue.

Applicants submit that the prior art of record fails to teach or suggest each and every element of the unique combination of elements of the claimed invention. Accordingly, this rejection should be withdrawn. For example, the prior art of record fails to teach or suggest the unique combination of elements of the claimed invention of claim 1, including the feature(s) of: "a channel stopper provided between the adjacent vertical transfer paths and *formed by an insulating layer having a trench structure, wherein a conductive substance to*

*which a predetermined voltage is applied is buried in the insulating layer and an oxide film is formed between the conductive substance and the adjacent vertical transfer paths."* (emphasis added) Accordingly, this rejection should be withdrawn.

Applicants submit that the references relied upon by the Examiner in this rejection do not teach or suggest the above-identified features. In addition, Applicants submit that it would not have been obvious to one of ordinary skill in the art to have modified the Maruyama reference as advanced by the Examiner. In the Maruyama reference, the alleged solid state image sensing device clearly does not include a channel stopper formed between adjacent vertical transfer paths. The Nishi reference is provided to show channel stoppers employed in charge coupled devices (CCD). However, the structure of the channel stoppers and/or the application of channel stoppers described in Nishi is not relevant to the claimed invention. For example, in col. 1, lines 56-68 through col. 2, lines 1-49 of the Nishi reference, the channel stoppers described do not employ the same structure of the claimed invention.

In Maruyama and Nishi, the described CCD's are of the so called "interline transfer type" in which the optical electronic converted signal output is sequentially output to the adjacent vertical CCD register. In contrast, the

claimed invention utilizes the CCD format of the so called "Frame transfer type" in which the received O-E signal is stored directly into the vertical transfer path. Since "interline transfer type" requires relatively long transfer rates of the output signals being transferred to the vertical CCD register, the light shielding film 3 is formed above the layer of the transfer electrode 11 in Maruyama. Further, "shunt interconnection 14" is also provided for the purpose of lowering the resistance of the transfer electrode. However, the existence of the shunt interconnection raises a particular problem in that functionality of the light shielding film might be diminished by the oxidation film that would be necessarily formed between the light shielding film and the shunt interconnection.

In the present invention, the channel stopper having the buried conductive substance prevents diffusions of the P type impurity, e.g., from the channel stopper itself to the vertical transfer path. Therefore, it is apparent from the above-described structural difference that none of the prior art references teach or suggest any portion analogous to the oxidation trench of the present invention in which the conductive material is buried for a specific and unique purpose. Further, it is quite difficult to replace the shunt interconnection as seemingly alleged by the Examiner with the channel stopper

of the present invention simply for the reason since the prior art references and the present invention are specifically intended to address separate problems.

The alleged combination of Maruyama in view of Nishi would not have been obvious as the types of CCD are different from the present invention, there is not any recitation of the problem of the P type impurity being diffused from the channel stopper in Nishi, and the channel stopper of Nishi is specifically structured such that the channel stopper is arranged away from the vertical register. Therefore, these rejections should be withdrawn and the present application should be passed to Issue.

As to the dependent claims, Applicants respectfully submit that these claims are allowable due to their dependence upon an allowable independent claim, as well as for additional limitations provided by these claims.

### **CONCLUSION**

Since the remaining references cited by the Examiner have not been utilized to reject the claims, but merely to show the state-of-the-art, no further comments are deemed necessary with respect thereto.

All the stated grounds of rejection have been properly traversed and/or rendered moot. Applicants therefore respectfully request that the Examiner reconsider all presently pending rejections and that they be withdrawn.

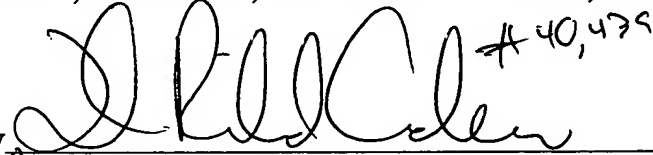
It is believed that a full and complete response has been made to the Office Action, and that as such, the Examiner is respectfully requested to send the application to Issue.

In the event there are any matters remaining in this application, the Examiner is invited to contact Matthew T. Shanley, Registration No. 47,074 at (703) 205-8000 in the Washington, D.C. area.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By  #40,479

Marc S. Weiner  
Reg. No. 32,181  
P. O. Box 747  
Falls Church, VA 22040-0747  
(703) 205-8000

  
MSW/MTS/cl